MECHELECIV

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SCHOOL OF ENGINEERING

In This Issue

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The Engineer's Ball

The date of the Engineering School's chief social event, the Annual Engineers Ball, draws near. Tickets will soon be available, at three dollars a couple, from members of the Engineers Council. Last year's ball was a complete social and financial success and it is expected that the coming soiree will surpass it in both respects. The proceeds, in case you weren't aware, help defray the expenses of the council, and who knows, perhaps your favorite free magazine (The Mecheleciv) will realize a few dollars.

Attendance will be limited, by Fire Department regulation, to 600 persons and you are urged to get your tickets early before they are all bought-up by speculators. Music for dancing will be furnished by the Alaskans, a top-flight local orchestra. There will be a door prize and a special prize for the highest score on the Kissometer. Refreshments will be limited to set-ups, so if you . . . , you had better . . .

The Kissometer, an electronic device for measuring thermal osculatory response, is the brain-child of John C. Nygard. John beat his lips to a pulp perfecting the circuit, and thinks it is foolproof. He declines to discuss the principle of operation of the gadget and states merely that there will be no electrodes to grasp and no possibility of electric shock. Several suggestions for beating the machine have been forwarded to us from questionable sources, and we pass them on to you for what they are worth.

1. Have the girl you are escorting use a graphited lipstick.

2. Gargle an electrolyte.

3. Dampen the soles of your shoes with brine.

4. Make certain that you have a high plate voltage, either upper or lower.

5. Acquire a large charge before being tested.

Several other ideas were rejected as impractical.

We'll be on hand to interview the winner to determine, in the interests of science, whether technical skill or sheer passion takes the prize.

Ben Sorin, President of the Engineers Council, invites all students and alumni to attend the ball, which will be held on Feb. 7, from 9 to 1, in the Hall of Nations Ballroom of the Hotel Washington. Dress will be semi-formal.

Dean's Column

This is the second issue of Mecheleciv with "The New Look." The present editors and managers have at last achieved a printed publication of which the pioneer publishers of this sheet dreamed when the first copy was run off the mimeograph machine a few short years ago.

This continuing improvement in the appearance of our engineering publication is made possible by increased income and continuing acceptance of the responsibility of turning out a publication regularly by a comparatively few engineering students. Having spent a very large part of my professional life in the publishing business. I know first hand that this contribution to the good public relations of the School of Engineering cannot be an occasional job. Several someones have to work!

The editors tell me that they hope to publish not only the news of the engineering student societies and engineering fraternities and of the other activities of the school, but to expand the news of the alumni and to print original engineering papers and seminar discussions. This should offer the opportunity for students and alumni to publicize their work. The editors hope particularly that the alumni will send in news of their professional activities as well as changes in position and responsibilities.

The Engineering Alumni Association of the University has contributed from the general funds a considerable sum for expenses which will be augmented by friends of the school. An active business manager for Mecheleciv has found it possible to secure increased advertising support.

All associated with this enterprise are to be congratulated on this further evidence of the vitality and team spirit of the students, faculty, and alumni of the School of Engineering. and I am glad to offer my congratulations and wishes for a Happy New Year to the January "Mecheleciv" with the "New Look."

DEAN FEIKER.

An Electronic Surveying System by C. R. HOOVER

Nearly all surveying problems resolve themselves into two fundamental jobs; measuring distances, and measuring angles. Methods and equipment for measuring angles are ahead, in facility and accuracy, of methods and equipment for measuring distance. With present standard equipment, measuring distances accurately is difficult and time consuming. Of course, distances can be chained fairly rapidly with good accuracy; or where accuracy is not too important, the use of a stadia rod with a transit provides a fast means for making such measurements. In excess of 1,000 feet the stadia method is too inaccurate for use, and chaining becomes increasingly difficult and time consuming. In fact, intervening water or rough terrain may make chaining impossible. Distances can, of course, be computed from triangulation data.

In recognition of the difficulties encountered in making accurate distance measurements by direct methods, surveying equipment manufacturers are continually working to improve the accuracy with which angles can be measured, thereby improving triangulation data. This method requires a known base line which has to be established by one of the foregoing methods, and unless the base line is well chosen with respect to the position of the distance to be measured, the final result will be far less accurate than was the measurement of the base line, even though the angle measurements were accurate to one part in 50,000.

It can readily be appreciated that a definite need exists for a new approach to this problem. Electronic systems offer such a new approach since they can measure distance in terms of the length of time it takes a pulse of electromagnetic radiation to travel to a target and return.

Radar systems which send out microsecond pulses of electromagnetic energy and measure their transit time to a target and return are quite familiar. However, radar systems lack the required directionality to measure angles with an accuracy suitable for surveying, and they are unable to resolve small targets against a background of trees, buildings and similar terrain features. The system described in this paper represents a modification of radar adapted to surveying requirements wherein electromagnetic radiation in the visible region is substituted for the longer waves of radar systems.

The electronic surveying system consists of three main components; the light source with its optical system, the light detector and its optical system, the electronic system for timing the pulse travel time and translating the time interval to distance.

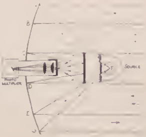

Fig. 1

The components sketched in Fig. 1 and a two stage preamplifier built into the photomultiplier housing are mounted in one piece so that they can be rotated about a horizontal axis perpendicular to the optical axis. The supports and bearings for this part are in turn mounted on a plate equipped with levels, leveling adjustments and a shaft and bearing for rotation about a vertical axis which intersects the optical axis and the horizontal axis. This unit is fastened to a tripod and is the counterpart of the standard transit used in conventional surveying operations. It is equipped with both a horizontal and vertical circle graduated in ½° divisions with verniers for reading the angles to one minute. In addition, tangent clamps and slow motion screws are provided for fine adjustment of pointing. The parabolic reflector (AG) serves both as transmitter optical system and receiver optical system, thereby keeping the optical axis of both systems coincident. The advantage of having the systems coaxial will be evident later. The light source (F) is a high pressure gas discharge tube. The tube has a breakdown potential of about 2800 volts and dissipates approximately 2 million watts for a period of half a microsecond. It is to be noted that although the pulses are extremely intense, the rate of flashing can be maintained low enough to keep power consumption within reasonable limits. The arc discharge is positioned at the focal point (F) of the reflector. Except for an annular surface (AB, EG), the reflector and all other parts of the optical unit are shaded from the light by mask (I) and the plane mirror (ST) to prevent scattered light from getting into the receiver system directly without going out to the target and returning. The outgoing beam is transmitted by the outer ring of the mirror while the center portion receives the effective portion of the return beam. As can be seen from Fig. 1, the return beam falls upon the parabolic reflector and then on the plane circular mirror (ST) from which it is folded back to a focal point (F), where a lens system reshapes the spot and images it on the cathode of the receiver tube. The receiver, which is a photomultiplier tube, is the most sensitive photo-emissive detector now known. It has a signal to noise ratio far higher than any conventional photocell because instead of having the cathode followed by a load resister, the cathode is followed by many stages of secondary emission wherein the signal is built up without the introduction of any so-called "Johnson Noise." The photomultiplier also has an extremely high frequency response. The pulse received is of such short duration that the receiver and all associated amplifiers must have a band pass of one megacycle in order to retain the proper wave shape.

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Alumnews *by* EMANUEL BECK

The first engineering curriculum established at George Washington University was under the Corcoran Scientific School, founded in 1884. The school gave degrees of B.S., B.S. in C.E., B.S. in M.E., B.S. in E.E., B.S. in Arch., and the graduate degrees of C.E., M.E., and E.E.

The first graduating class of the Corcoran Scientific School received their degrees in 1888. It consisted of 4 men and two women. There were three engineers in this first graduating class. Here are brief sketches of these first engineering alumni.

Edward Hallaran Booth—

He received a C.E. degree in 1888 after receiving his undergraduate B.S. from Emory and Henry College in 1878. He was a clerk in the United States Patent Office in Washington, D.C.

Arthur Powell Davis—

He received his B.S. in 1888 and an honorary Sc. D. in 1917. He rose to the position of Chief Engineer of the United States Reclamation Service.

George Washington Littlehales—

He received a C.E. degree in 1888 after graduating from the United States Naval Academy in 1883. Mr. Littlehales was a hydrographic engineer in the United States Hydrographic Office and a professor of nautical science at G.W. He was the author of numerous research papers on hydrography, oceanography and terrestrial magnetism. He was President of the Philosophical Society of Washington in 1905. Vice-President of the American Geographers Association in 1906, Vice-President of the Washington Academy of Sciences from 1911 to 1914, and a member of the Cosmos Club of Washington.

———O———

William T. Latham—

B.S. in C.E. in 1936, Mr. Latham is now affiliated with the Aeronautical Chart Service in a technical capacity. During the war he was a major in the A.T.C. and responsible for the production of charts for use in connection with radar and allied electronic devices used by the U.S. Army Air Forces throughout the world.

Previous to entering the service Mr. Latham held technical positions with the Hydrographic Office. U.S. Navy and with the Civil Aeronautics Administration.

William Penn—

B.M.E. in 1941, Mr. Penn joined the Alabama Dry Dock and Ship Building Co. upon graduation. In July 1944 he joined the Brunswick Shipyards, Brunswick. Georgia.

Carl O. Jett—

A former engineering student at G.W., Mr. Jett was recently appointed system telegraph and telephone engineer for the Union Pacific Railroad.

Albert Weiss—

A former engineering student at G.W., in 1935 Mr. Weiss was employed by the United Transformer Company, and later by the White Sound Company. Since 1941 he has been serving as radio engineer with the ordnance development division of the National Bureau of Standards. Mr. Weiss was the co-author of a technical article. "Synchronization of Oscillators." which appeared recently in the "Proceedings of the I.R.E."

William Switney—

B.E.E. in 1947 is now with the Consolidated Edison Company of New York.

Al Barauck—

B.E.E. in 1947 is now employed by the Pacific Gas and Electric Company at San Francisco, California.

John E. Doane—

B.S. in Eng. 1946. Mr. Doane was employed as a radio inspector by the F.C.C. During the war he served in the navy and while stationed at the Navy Department he attended night classes at G.W. He then served on an aircraft carrier in the Pacific and upon his return he resumed his studies. Mr. Doane is now again connected with the F.C.C.

Anders R. Lofstrand, Jr.—

A former engineering student at G.W., he holds patents on intricate machinery ranging from sterilizing equipment to aeronautical training devices. Mr. Lofstrand is secretary-treasurer of the Lofstrand Company which manufacturers sterilizing equipment. He developed a new type metal collapsible crutch which braces against the forearm and does not reach above the elbow.

At present Mr. Lofstrand is a legislator in the Maryland General Assembly as a member of the Montgomery County Delegation.

James A. Brearley—

B.S. in 1903 and M.E. in 1905, Mr. Brearley came to Washington in 1882 and ten years later was employed by the government as an apprentice mechanic. In 1906 he was transferred to the Patent Office as an assistant examiner. He rose to chief clerk of the Patent Office in 1925 and remained in that position until his retirement in 1946. He is now residing at 325 Second Street, S.E., Washngton, D.C.

(Continued from Page 2)

At this point a detailed description of the target which returns the pulse of light to the equipment is necessary in order to properly understand the operation of the equipment as a whole. The target consists of a retrodirective reflector. Three reflecting surfaces are arranged in the form of a corner of a cube (all surfaces mutually perpendicular) with the reflecting surfaces toward the inside of the cube. A ray of light entering the volume bounded by the three surfaces from any angle will be reflected three times and will follow an exit path which is parallel to the entrance path. Proof of this statement can be found in optics texts. The axis of the reflector is a diagonal of the cube. When the surfaces are optically ground the angle of divergence of the return beam is less than 5 seconds. It is for this reason that transmitter and receiver optical systems are made coaxial. The actual targets used are cube corners with a front face about two inches on each side. This type of reflector makes an ideal target for the surveying equipment because the orientation of its axis with respect to the light path need be only a very rough estimation (plus or minus 20° is good enough). Although light would be reflected diffusely from any surface, it is necessary to have an outstandingly brilliant return in order to differentiate from surrounding trees and brush, a specific target to which the distance is being measured. The only disadvantage to using an ordinary plane mirror would be the difficulty of properly orienting it. The preamplifier of this unit is connected with the main electronic unit through a delay line which provides a slight delay to permit the timing circuits to get into operation before a pulse returning from a target at zero range reaches the main vertical amplifier.

Before going into the details of the electronic circuits, reference will be made to the presentation of the data on the oscilloscope screen in order that a preliminary conception can be gained of what is required from the electronics.

Fig. 2 represents the pattern presented on the oscilloscope during a typical ranging operation. Two sweeps appear. On the upper is a single pip which results from the reflected light hitting the photomultiplier. It will be referred to as the echo pip. On the lower sweep are three or four range pips. These are produced by a local crystal controlled, temperature compensated oscillator. The actual time between these range pulses (1/327,760 of a second) is the time required for light to travel to a target 500 yards away and return. Therefore the distance between range pips on the lower sweep serves as a measuring stick for determining the position of the echo pip on the upper sweep in terms of target distance.

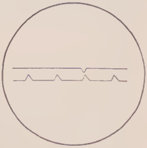

Fig. 2

The pulses coming from the local oscillator are fed through a phase shifter which is controlled by the main range dial so that in making a range measurement the dial is turned, moving the pips on the lower sweep until one of them comes into line with the echo pip on the upper sweep. The range is then read directly from the dial.

Fig. 3 is a block diagram of the entire electronic system. An antenna picks up interference from the flash lamp and feeds it directly to the timing circuits which control the sequence of events that follow every flash of the lamp. Having the transmitter (light source) control the sequence of events is one of the big differences between this system and conventional radar systems. Normally in radar, master timing circuits control all events including the emission of the pulse. However, no accurate method for controlling the discharge of the arc seemed feasible so it was allowed to fire at random and act as the trigger for all the rest of the events. The timing circuit consists of two "flip-flop" (multivibrator) circuits and a delay circuit. The flip-flop circuits rest normally with one triode conducting and the other biased beyond cut-off. This will be called its normal state. When either of them is tripped the section which was previously conducting cuts off and the section previously cut off conducts. This will be called its tripped state. The time required to change from one state to the other is far less than 1/200 of a microsecond (the approximate time required for light to return from a target one yard away) so even for these purposes it is considered zero time. Each multivibrator circuit remains in its tripped state for a short interval of time (specified later) and automatically returns to normal and so remains until tripped again. The relay circuit is merely an RC network controlled by the coarse range control knob. Its function is to delay the start of the sweep after the first multivibrator is triggered so that it will occur during a time interval that includes the return of the light pulse. In other words, although the range of the instrument is 5,500 yards, the sweep merely covers about 1,500

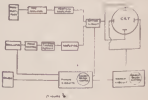

Fig. 3

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WITH OUR SOCIETIES

ASCE

The December meeting of the A.S.C.E. featured a very interesting and informative talk on "The History and Development of Highways in the United States" by Mr. Robert E. Royal from the Public Roads Administration. Mr. Royal emphasized the work of the Public Roads Administration in developing our present highways and the need for further improvement. After the talk slides were shown picturing the development of our roads from the days of the first mud trails to the present modern divided highways.

Our society has taken the initiative in the revival of the Annual Regional Conference of Student Chapters of the A.S.C.E. in this section. In all probability it will be held here sometime this Spring. The Conference usually lasts one day with field trips in the afternoon and a banquet in the evening. One of the main purposes of the Conference is to give students from different schools a chance to meet one another.

* * *

AIEE

Great plans were formulated at the December meeting of the "Double E's"; banquets with the Washington Section were discussed, field trips are in the development stage, and projects for participation in the district "News Sheet" were launched. Movies were shown on electronics and the work of the Seabees. Refreshments were served at the conclusion of the movie on electronics.

The January meeting will feature Mr. W. G. Hills, managing director of the Electric Institute of Washington, who will speak on the "Cooperative Movement in the Electrical Industry." Without a doubt, this new and different subject will be very interesting to all engineers, and a large turnout is to be expected. In addition, John Church, our able refreshment committeeman, has promised delicacies that will tempt even the most discriminating gourmet.

* * *

IRE

43 IRE members accompanied AIEE in the last field trip, which means the next trip, now being planned, should be well attended. It will be a visit to WNBW, a local television station.

An organizing committee for a ham transmitter network between colleges is being headed by Frank Simmons. Harold Thomasson is the chairman of a student committee designing, building and installing speech recording equipment for the Radio Workshop in Lisner Auditorium.

THETA TAU

Greeting a New Year was not enough to content Theta Tau, so we held a special welcoming of our own. On Sunday, January 3, we initiated sixteen new members into the fraternity.

After the initiation ceremony, each of the members hurried off, picked up his 'guiding light,' and meandered down 'ole Virginny' way to a gay rendezvous amidst a rustic setting.

It is with real pride that Gamma Beta Chapter announces the following new members: Arthur Brown, Charles Campbell, John Church, Scott Ebrite, James Le Croy, Reid Mayo, John Le Reche, George Plondke, Samuel Raker, James Sinsabaugh, Edwin Stengard, Ford Wheeler, and Norman Ziegler.

* * *

ASME

The December meeting of the A.S.M.E., after a short business meeting, was honored by the presence of Mr. William J. Mayer of A. M. Byers Company who gave a short introductory talk followed by a film entitled "Eternally Yours" on the method of wrought iron production. Mr. Mayer then gave a spirited lecture on Radiant Panel Heating.

Beginning with a short discussion on the fundamentals of radiant and convection heat transfer, Mr. Mayer presented a simple design procedure for computing the length, size and spacing of pipe and floor panel installations based on conventional heating load computations.

Various heating installations were illustrated by slides, showing the growing popularity of panel heating for a wide variety of structures.

Mr. Charles Kottcamp, of the Locomotive Development Committee, Bituminous Coal Research, Inc., was to speak on The Coal Burning Gas Turbine Locomotive at the next meeting.

* * *

SIGMA TAU

Xi chapter of Sigma Tau held its winter initiation banquet at the Lafayette Hotel on Saturday, Dec. 13. Among the active, alumni and honorary members present were Dean Feiker; William F. Roeser of the National Bureau of Standards and National Councilor of the fraternity; Dr. Bardsley of the National Bureau of Stan-

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Dwight H. Hastings

DWIGHT H. HASTINGS, senior M. E. student and former journeyman machinist, hopes to utilize both his school and shop training in his future work. He would like to specialize in either machine tool design or production engineering of machined parts. Working problems is his forte; once he has attacked one, he harasses it until it succumbs.

His practical experience was acquired through an apprenticeship with the Landis Tool Co., of Waynesboro, Penna. This was followed by a more urgent training, when in 1942 he joined the Air Corps as a cadet. In March, 1944, he was sent to Italy as a co-pilot of a B-17 in the Second Bomb Group of the 15th Air Force. He flew many missions over Germany and Austria and also participated in the bombing of the Ploesti oil fields. He had completed 42 missions, and was a flight commander, when he was shot down over Bleckheimer, Germany. The next nine months were spent as a POW, chiefly in Stalag Luft 3.

Three weeks after his return to the U.S. in June, 1945, he married Jean Whittington of Waynesboro, Pa. Mrs. Hastings is now employed as a research assistant for the U.S. News Association.

Dwight is a member of Sigma Tau and Theta Tau, and is one of the A. S. M. E.'s representatives on the Engineers Council. He is looking forward to becoming a George Washington alumnus so that his wife can stop working and they can start raising a family.

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dards and formerly a member of the faculty; Mr. Bob McKnight, president of the Alumni Association.

Twenty-one new members were initiated. Because of the large number it was impossible to hear all the initiates present the paper which each had prepared for the occasion. Instead, names were drawn and four papers were presented. Excellent talks were given by: John Church on "Application of Gas Turbines in Electric Power," David C. Colony, Jr. on "Necessity for Expansion of Air Port Facilities," Frank Soucek on "Use of Power Lines for Carrier Telephony," and Matthew Polk on "Method of Attack in Machine Design."

The new initiates were: Dwight S. Ashley, Lawrence R. Brown, John Church, David C. Colony, Jr., James C. Gregg, Dwight F. Hastings, Vincent Hennessey, Ray Johnson, Jean Jones, Elwood H. Mullins, John C. Nygard, Philip W. Osborne, Matthew Polk, Raymond S. Potter, Samuel H. Raker, Sherwin Rubin, Robert D. Sale, James L. Shumaker, Frank B. Soucck, Reginald L. Vasser, and James A. Sinsabaugh.

(Continued from Page 4)

yards in order to enlarge the scale and make the pip matching easier. It is therefore necessary to select the 1,500 yard interval which will include the echo pip from a specific target.

When the lamp flashes, the first multivibrator is tripped and some interval later (controlled by coarse range setting) sets the sawtooth sweep circuit in operation and the upper trace on the screen is started. This will be considered phase 1. With the timing circuit in Phase 1, the gate circuit permits the output of the vertical amplifier to be fed to the vertical plates of the cathode ray tube while the output of the local oscillator is blanked. Some time interval after the initiation of the upper sweep, depending on the distance the target is from the instrument, the return light is picked up by the photomultiplier and the pulse is fed through the preamplifier and vertical amplifier and appears on the vertical sweep as the echo pip shown in Fig 2. After approximately 35 microseconds, a time corresponding to the full 5,500 yard range of the instrument, the first multivibrator returns to normal and in so doing trips the second multivibrator. This will be called phase 2. During phase 2 and 3 the gating circuit suppresses the output of the vertical amplifier and permits the output of the range pip amplifier to be impressed on the vertical plates of the cathode ray tube. In addition a bias is applied to the vertical plates to displace the second swecp below the first. During phase 2 the local oscillator is continually tickling the second multivibrator as the voltage on the input grid is dropping, until finally the peak of one of the pulses trips the second multivibrator back to its normal state and in so doing trips the first multivibrator again, hereby initiating the sweep a second time. The timing circuit is then in phase 3. When it changes to phase 3, the sweep displays the range pips. The displacement between the two sweeps is adjusted by a manual bias control. By having the local oscillator actually trip the multivibrator, the phase relationship between the initiation of the sweep and the oscillator can be held constant. The exact time interval between the first sweep and the second sweep is unimportant so long as the second sweep always bears a fixed phase relationship to the local oscillator. The multivibrator which is in the tripped position during the phase 3 returns to normal after completion of the sweep, this time without tripping the second multivibrator. The instrument is now in its original state, ready for another flash of light. The flashes occur at about 20 per second. Since the phase shifter follows that position of the local oscillator amplifier where the pulse is taken off for the timing circuit a change in phase relationship between the pulses fed to the range pip amplifier and the pulse initiating the second sweep can be varied by turning the phase shifter knob. This has the effect of moving the range pips back and forth on the lower sweep. In effect, then, what you have

(Continued on Page 7)

is an echo pip whose position on the upper sweep depends on the range and an accurate ruler to lay alongside this sweep for measuring the position of the echo pip. By matching the echo pip with a range pip, the setting of the coarse range dial plus the setting of the phase shifter dial gives the actual range in yards.

An additional feature which was not previously mentioned is the search-range switch shown on the sweep circuit, Fig. 3. When the operator is trying to locate the target this switch is placed in search position, thereby eliminating the lower sweep with its range pips and changing the horizontal sweep speed so that the entire range of the instrument is presented on the one sweep. After the operator has accurately pointed the instrument both vertically and horizontally, the switch is moved to range and the circuits go into the sequence of operations described above.

In actual practice, the equipment is set up over one of the two points between which the distance is to be measured, and the target reflector is set up over the other. A zeroing procedure is followed to compensate for different methods of matching pips followed by different operators. It does not matter how the matching is done so long as the same method is used for making zero adjustment and actual range measurements. To obtain a zero range a reflector is clamped to the front of the instrument and the range dial is clamped at zero. Then the phase shifter is slipped until the pips match. When the dial is unclamped and the reflector removed from the front, the unit is ready for use. The operator uses a fairly fast flashing rate for searching and with the search-range switch in search position, he points the equipment in the general direction of the target and moves the optical unit slowly back and forth through a horizontal sector changing the vertical pointing about a degree between each traverse until an echo pip is seen on the screen. Readjustments of both horizontal and vertical angles are made until maximum pip height is obtained. At this point the azimuth is determined and readings of horizontal and vertical angles can be made from the respective circles. These angles are accurate to plus or minus 1 minute.

To determine the range, the range pips are deblanked by moving the search-range switch to range and the coarse range adjustment is moved to whatever position is necessary for bringing the echo pip into the center of the screen. The adjustment of the fine range control (phase shifter) is made to bring one of the range pips into alignment with the echo pip. While procedure varies with operators' personal preferences, best results seem to be obtained by adjusting the vertical amplifier gain until the echo pip and range pip have nearly equal amplitudes.

The error of any one range measurement made by this system appears to be about one yard. This represents a random error which is independent of range. Obviously then, the percentage range error improves with range until at its maximum range (5,500 yards) the error is less than .02%

This system has the decided advantage over chaining that intervening terrain is of no consequence so long as the two points are in a line of sight. It has the advantage over triangulation in that no previously established base line is required. Approximately twenty minutes are required to set up the equipment in a given location and make a single reading.

NOTE: *Work on the equipment described in this paper was done under the sponsorship and supervision of the Engineer Research and Development Laboratories, Ft. Belvoir, Virginia, at the Armour Research Foundation, Illinois Institute of Technology, Chicago, Illinois. Acknowledgement is made to the Radio Corporation of America, who developed special photomultipliers, to the General Electric Company and the Amglo Corporation for the Development of the flashlamps, and to the Bell Telephone Laboratories for their basic developments in range measuring equipment utilizing the transit time of light pulses.*

John C. Nygard

John C. Nygard—Born: 1921, New York City. That was how it all started, but how were we to know that he would want to come to George Washington. You might think that with all his service travels he might have tried for a European scholarship or some school on the west coast, but—say, stop rushing him—how did we get on page four and Mr. Nygard isn't out of grade school yet, let alone coming to college.

John graduated from the DeWitt Clinton High School, New York City, with the class of '38, and after working for the Capehart Radio Company of the same city for a short time, he enlisted. You've heard of fellows that knew what they wanted, and evidently John knew, because it was only one month after the war in Europe started that he gave his services to the U.S. Coast Guard.

Two years of sea duty in the North Atlantic patrol brought him back to teach radio for another two years at New London, Conn. The next two years were spent in the research division of the Coast Guard Radio Lab. in Alexandria, Virginia. This part of his Coast Guard career was the best in his estimation—in between LORAN and radars he traveled about from station to station repairing any *bug-a-boos* which had arisen.

At long last, he was discharged in November, 1945, and it was soon after (February, 1946) that he started with his E.E. major at George Washington University. Even here he isn't going to dilly-dally around, because he hopes to get that degree by September, 1948. By the fact that he had the ability to work up to the rate of Chief Radio Technician while in the service, I would say that he's liable to graduate in that short a time.

In February, 1943, he married a girl whom he had known before going into service—Miss Phyllis Parchen of New York City. She is now working in Alexandria, and is probably helping to put her wayward husband through school. Why wayward? What would you call a happily married man who starts making gadgets like Kissometers?

At George Washington Mr. Nygard has been pledged to Sigma Tau, and is the treasurer of AIEE and business manager of the Hobby Shop. This last is one of his favorites, as he helped it to get its start, and he definitely wants to see it become an active organization on the campus.

Annual Engineer's Ball

open to all George Washington

Students and their Guests

February 7, 1948 **Dancing 9 to 1**

Hall of Nations

HOTEL WASHINGTON

$3 per couple including tax

DRESS OPTIONAL

Music by the Alaskans

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